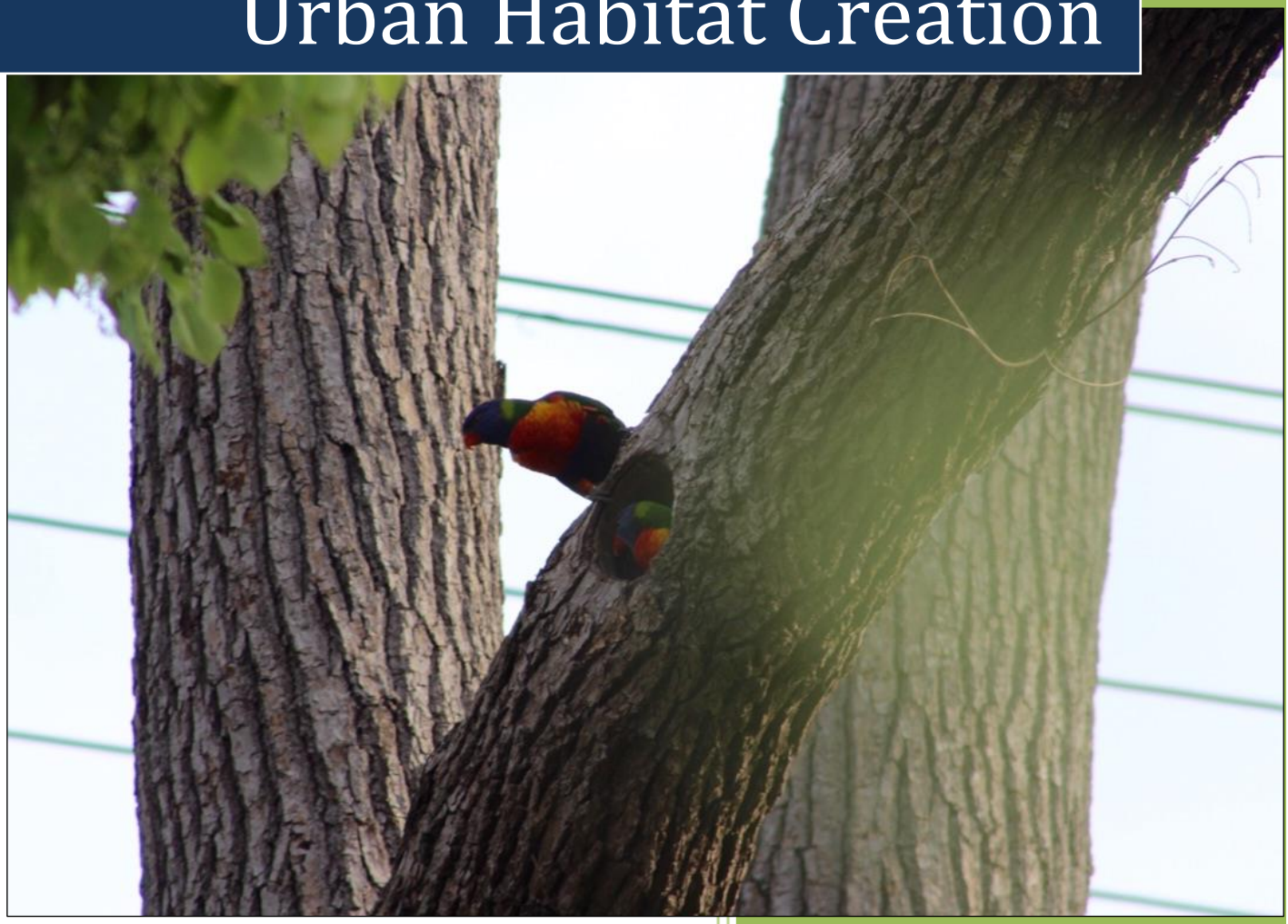
Urban Habitat Creation



Sydney Arbor Trees
PO Box 286, Botany
NSW, 1455
Tel: 02 9666 6821
Fax: 02 9666 6312
Mob: 0403 930 604
michael@sydneyarbor.com.au
ABN: 39 106 413 610

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Sydney Arbor Trees' Objectives

At Sydney Arbor Trees, we acknowledge the importance of urban habitat, and the fact that it is disappearing rapidly. Trees are a vital element of habitat for wildlife, especially so in cities. As arborists, we are acutely aware of the number of trees that are removed unnecessarily, and so are deeply concerned about our urban critters. This is not just because we like small fluffy animals, but because we fully understand the part they play in tree health and reproduction.

Aside from being cute and fascinating, animals that live in trees also assist in their pollination, as well as controlling pest populations. To be effective pollinators however, requires the ability to get from one tree to the next. This is not a problem for birds, but mammals and reptiles must come down onto the ground, but will not do so if they feel exposed. This is where the importance of wildlife corridors comes into play. If wildlife cannot move around comfortably, they cannot search for food or expand their territories effectively. Obviously, difficulties finding food is going to cause problems. Less obvious though is the fact that genetic diversity diminishes, as the lack of opportunities to search widely for mates leads to inbreeding.

A good example of the interconnectedness of ecosystems can be seen in the Grey Box (*Eucalyptus moluccana*) population of the Cumberland Plain across Western Sydney. A massive proportion of these trees have been killed by an insect pest over recent years, and many, many more are in serious decline. This is thought to have been brought about by the removal of so much undergrowth for agricultural purposes. This undergrowth was habitat for birds and animals which previously fed on of this insect (a psyllid), and prevented such outbreaks as we are now seeing. If the removal of undergrowth can be so detrimental to the trees above, we can only imagine how devastating the loss of entire forests is going to be.

On top of this, recent knee-jerk policy decisions, such as the schools safety review and the Rural Fire Service's 10/50 determination, are leading to the unregulated removal of trees and wanton destruction of habitat.

As arborists, we are not just in a position to see the damage that is being done, but we also have the skills and equipment to do something about it. We not only have the means to access trees, but also the experience required to perform the bore cuts employed in habitat creation. Bore cutting has an increased likelihood of chainsaw kickback, which is extremely dangerous, and should only be undertaken by expert operators.

Arborists also have the tree knowledge and training to assess trees for safety hazards, which is a critical aspect of habitat creation. Habitat creation, if undertaken improperly, has the potential to develop weaknesses in trees which can lead to failures and, in urban situations, this is unacceptable. As such, habitat creation should only be conducted by appropriate professionals.

Sydney Arbor Trees can:

- Prune veteran trees
- Create artificial hollows for birds
- Create artificial hollows for mammals
- Create artificial hollows for bats
- Create terrestrial habitat for reptiles and invertebrates
- Create aquatic habitat for fish and crustaceans
- Provide consultation on habitat creation

You can contact us on **02 9666 6821** or via **www.facebook.com/urbanhabitatcreation**

Introduction

In the modern age, trees are usually viewed in terms of amenity and safety, with unsafe trees being removed entirely. What is generally overlooked is which aspects of the tree could be retained for the benefit of local wildlife and biodiversity. Urban communities have a preoccupation with sanitation, which is often to the detriment of the critters we share our environment with. Dead and decaying wood is a food source for insects and other invertebrates, which are in turn food for reptiles and mammals and birds. Trees – alive or dead – which contain hollows are habitat for all manner of organisms. Unfortunately, many trees with hollows are deemed too hazardous for urban situations, and end up being cut down. In many circumstances this is necessary, but it is time to re-think to what extent they are removed, and what could remain as habitat.

Cavities in trees can take decades or even centuries to develop into a large enough space for birds and animals to live in[1]. In urban scenarios, it is often the older trees that are removed for reasons of safety – because they contain decay and cavities, and because older trees are more likely to succumb to the pressures of development. This results in a massive shortfall in cavities required by the local wildlife[2]. It is estimated that 15% of Australian vertebrate species use natural tree hollows for nesting, raising young and housing[1]. In NSW alone, over 150 species of wildlife use cavities, and are referred to as obligate hollow users. Around 40 of these species are listed as vulnerable or endangered[2]. While most species have very specific requirements for the dimensions of hollows they will inhabit, some overlap and this causes competition between species, which adds to the struggle these species already face[1].

Pruning for habitat does not always involve the cutting-in of artificial hollows. Sometimes the tree itself will already contain hollows due to extreme old age. These elderly trees generally become more hazardous as they age, which often leads to their removal. We refer to these specimens as veteran trees, and employ vastly different pruning techniques in their management – aimed at removing hazards, but also extending decay.

The opportunity to create habitat in urban situations does not rely solely on standing trees. Logs on the ground are also important sources of food and shelter – mainly for reptiles and invertebrates – and the longer they are left to decay, the more valuable they become in this sense. Logs can also be used for the construction of aquatic habitat, partially or wholly submerged, for birds, amphibians, fish and crustaceans. Our obsession with sanitation leads to all timber from removed trees being turned into wood chip.

Although dead trees and logs are not aesthetically pleasing to many people, with time and education this could change, and the arboriculture industry is ideally placed to play a large part in this. As people come to a greater understanding of the importance of urban wildlife, and the supporting role that trees – dead as well as living – play, hopefully dead trees and logs will come to be seen as a thing of beauty or at least a necessity.

As long as habitat creation practices do not exacerbate any safety concerns, it should be a consideration during any tree removal process. In the author's opinion, any negative aspects of the 'ugliness' of dead trees and logs are far outweighed by the benefits of having native birds and animals present on your property.

[1] Gibbons, P. & Lindenmayer, D. 2002. *Tree Hollows and Wildlife Conservation in Australia*.

[2] NSW Environment & Heritage. 2014. *Loss of Hollow-bearing Trees – key threatening process determination.*

The hollowing process

Firstly, a break in the bark covering must exist – to allow infection to begin.

Then the timber exposed by the wound is colonised by a fungal pathogen.

The timber that has been softened by fungus is then consumed by invertebrates – often termites.

The developing cavity can then expanded by fauna keen on habitation – especially parrots.

This process takes many decades.

We can speed this process up!

Pruning Veteran Trees

Veteran trees defy precise definition, but include trees in the following categories[3]:

- trees of interest biologically, aesthetically or culturally because of their age;
- trees in the ancient stage of their life; and
- trees that are old relative to others of the same species.

As already mentioned, trees become more valuable as they age, and especially in terms of habitat. As trees mature, their transport networks start to struggle with pumping water and nutrients from their roots all the way to the branch tips, and as a result, the branch tips start to die back. The dead sections of canopy eventually break off and fall, leaving behind wounds and damaging any sections of tree below, which allows fungal decay to enter the timber. Fungal decay softens wood which allows for other larger organisms to move in behind, and starts off the process of cavity formation. This process also has the effect of recentralizing the tree's centre of gravity, and reducing the 'sail' area. Known as retrenchment, this process can effectively extend the lifespan of the tree by many years, even decades. It is a natural part of plant senescence (deterioration with age), and is outlined below in Figures 1 & 2.

Figure 1 - 6 stages of tree aging[3].

Ideally, veteran trees would be left untouched, to allow the hollow-forming process to happen naturally. As discussed however, this is only rarely achievable in urban situations, due to the dual pressures of safety and sanitation. As this is such a loss of resources, a compromise must be reached, and pruning maintenance is one option.

Pruning maintenance for veteran trees strives to replicate the natural process described above. Usual arboricultural practices – aimed at minimizing damage and preventing decay – are abandoned. Deadwood is retained, branches are torn off rather than cut cleanly, and damage is done with the intention of introducing decay to form cavities.

Where the sections of a veteran tree containing hollows must be removed due to safety concerns, artificial hollows can be cut in as compensation, or in the absence of veteran trees, artificial hollows can be cut into younger trees to speed up the natural process.

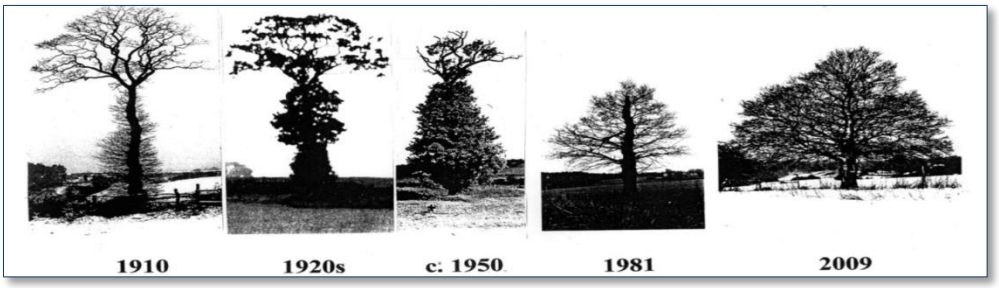


Figure 2 – 99 years in the life of the ancient Arthur Clough Oak in Boars Hill, England[4].

[3] Helen Read. 2000. *Veteran Trees: A guide to good management*.

[4] Neville Faye. 2011. *Conservation Arboriculture: Learning from old trees, artists and dead poets.*

Identifying potential habitat trees

Is there a target?

NO

Retain tree
- Retain amenity for humans
- Retain amenity for wildlife

YES

Can hazard be eliminated through pruning?

YES

Prune tree
- Reduce amenity for humans
- Reduce amenity for wildlife

NO

Does entire tree require removal?

YES

Remove tree
- Lose amenity for humans
- Lose amenity for wildlife
- Lose dead wood from food chain

NO

Create habitat tree
- Reduce amenity for humans
- Enhance amenity for wildlife

Types of artificial habitat

Habitat can be developed within standing trees, whether dead or alive – as long as no hazards are created in the process. This can be as simple as using pruning techniques and other methods to deliberately enhance the spread of decay, or the selection of which deadwood to retain.

Figure 3 - Tear cuts leave a large surface area of exposed timber for decay to move into.

Figure 4 - Boring into old wounds promotes decay, as well as providing space for small invertebrates to inhabit.

Or it can be as elaborate as actively cutting cavities into stems and branches, purposefully creating hollows with dimensions specifically required to attract the desired wildlife.

Figure 5 - A nesting box intended for parrots.

Figure 6 – 'Bat flats' for the use of microbats.

Logs can be sculpted and positioned to provide habitat on land and in water. Some logs are already sufficiently decayed that any further cutting is unnecessary.

Figure 7 - A 'trench cut' has been sculpted into what will be the underside of a log, intended as shelter for reptiles and to enhance decay.

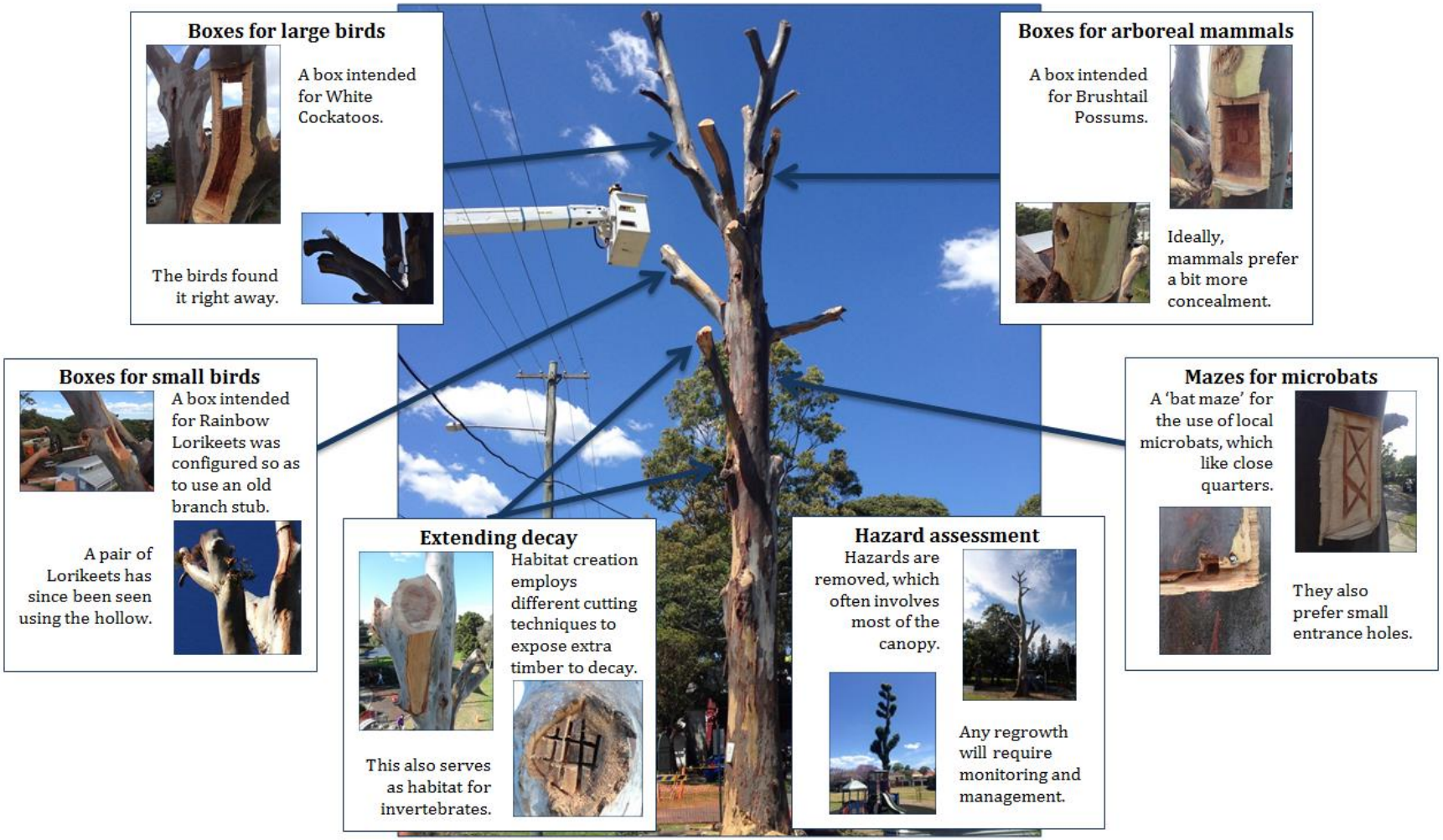
Figure 8 - An example of a log that wouldn't even need any sculpting, as natural decay has already formed extensive habitat.

Specific cutting can provide shelter for reptiles and amphibians, fish and crustaceans, and all cutting provides opportunity for decay to develop.

Figure 9 - A log that has been sculpted for aquatic habitat, that is to be rolled over and positioned in a river.

Figure 10 - A log being positioned by crane into a lake, designed as a bird and amphibian perch above water, and a fish and crustacean shelter below.

Aspects of Habitat Creation in standing trees



Creating habitat in standing trees

The assessment of trees for safety purposes, or the process of quoting for tree removal, is a perfect opportunity to recognise any qualities the tree may have that would enable the creation of habitat.

Habitat creation in live trees is probably preferable to the use of dead trees, as the live canopy offers protection from predators and reduces exposure to the elements, as well as providing a food source that is close to home. In live trees, stubs from broken limbs are excellent candidates. Likewise, the ends of limbs that are to be pruned off can be retained for this purpose.

This is not to say dead trees should be excluded, as they also play an important role. Dead trees provide perches for birds to sun themselves, socialise and even hunt from. Indeed, the removal of dead trees and dead wood is also recognised as a key threat to biodiversity, as it reduces the availability of hollows in the long-term, as well as the reintroduction of organic material into the soil[5].

Likewise, the deadwood present in a live tree's canopy should also be considered for retention, depending on its size and potential to cause harm if it falls. Deadwood that is likely to fall is of no use.

Figure 11 - The stub left from a failed branch is an ideal candidate for habitat creation, particularly if decay was the cause of failure.

Figure 12 - Dead stubs that don't pose a hazard to safety should be retained. In this example termites have already begun the hollowing process.

Obviously, all considerations of habitat creation should focus firstly on any potential hazards that would be created in the process. For example, cavities should not be cut into live stems or branches (that still have the end-weights), as their structural strength would be drastically reduced.

[5] NSW Environment & Heritage. 2011. *Removal of dead trees and dead wood – key threatening process listing.*

In many cases, the tree will die during the process of making it safe, as the end-weight of branches needs to be removed. Figures 13 & 14 below are examples of how a tree, (in this case a mature *Eucalyptus saligna* up for removal due to repeated dropping of large limbs next to a playground), should be made safe through end-weight removal and lever arm reduction.

Figure 13 – Before.

Figure 14 – After.

Efforts can be made to restrict the remaining timber from sprouting epicormic regrowth, as epicormic shoots are poorly attached and fail regularly. This can be achieved by ring-barking the stem or branch just outside its main union. Girdling is also effective in killing branches to create stubs. In instances where the now bare tree is overly exposed, epicormic regrowth may be required to provide some shelter, however this will require on-going risk management.

Figure 15 - Girdling a branch with wire or rope cuts off the transport networks and, over time, will kill the branch.

Figure 16 - Ring-barking a limb will eventually kill it. On-going management of epicormic regrowth will be required.

In branch stubs – alive or dead – cavities can be created in several ways. One such technique involves removing a face plate from the end of the stub, then boring downwards into the end of the limb, before drilling an entrance hole and reattaching the face plate. Configurations and dimensions can be tailored to attract specific animals.

Figure 17 - A branch stub which has been bored out and had an entrance hole drilled from below.

Figure 18 - The same branch stub with the face plate reattached.

Cavities can also be cut into the sides of branch stubs or main stems by removing a face plate, boring out the desired dimensions, drilling an entrance hole and reattaching the face plate.

Figure 19 - The face plate has been removed and bore cuts made. After the blocks are broken out and an entrance hole is drilled, the face plate will be reattached.

Figure 20 – A completed medium parrot box.

Deadwood can also be utilised for creating cavities. In some ways it is preferable – it often has decay present already, and looks more natural. It is created in much the same way as the examples for live wood already presented.

Figure 21 - Boring through the end of a dead stub forms a more natural entrance hole.

Figure 22 - The hollow is created using the same process as described for live wood.

Microbats are particularly vulnerable to habitat loss in urban areas. 'Bat flats' and 'bat mazes' contain much tighter cavities than other hollows, as microbats prefer close quarters – probably to aid in the exclusion of predators, and to aid in temperature regulation. The process is very similar to the techniques already described, differing only in that much less boring is required. After the face plate is removed, a shallow 'hallway' is bored which joins up to a small entrance hole. There are several different configurations we employ. Creativity can be used here, and chambers of the maze can differ in depth, as long as the area adjoining the entrance hole remains restricted enough to prohibit predator access.

Figure 23 – 'Bat flats' are designed with areas of differing depth, but with restricted access.

Figure 24 - Showing the small entrance holes after the face plate is reattached.

Below is an example of a tree which has been retained for the purpose of habitat creation. Viewed from this side, there is little visible evidence that any habitat cutting has been done. While the skeleton of the tree will be seen as an eyesore by many, the presence of wildlife and the opportunity to use it as an educational tool are of benefit to the community.

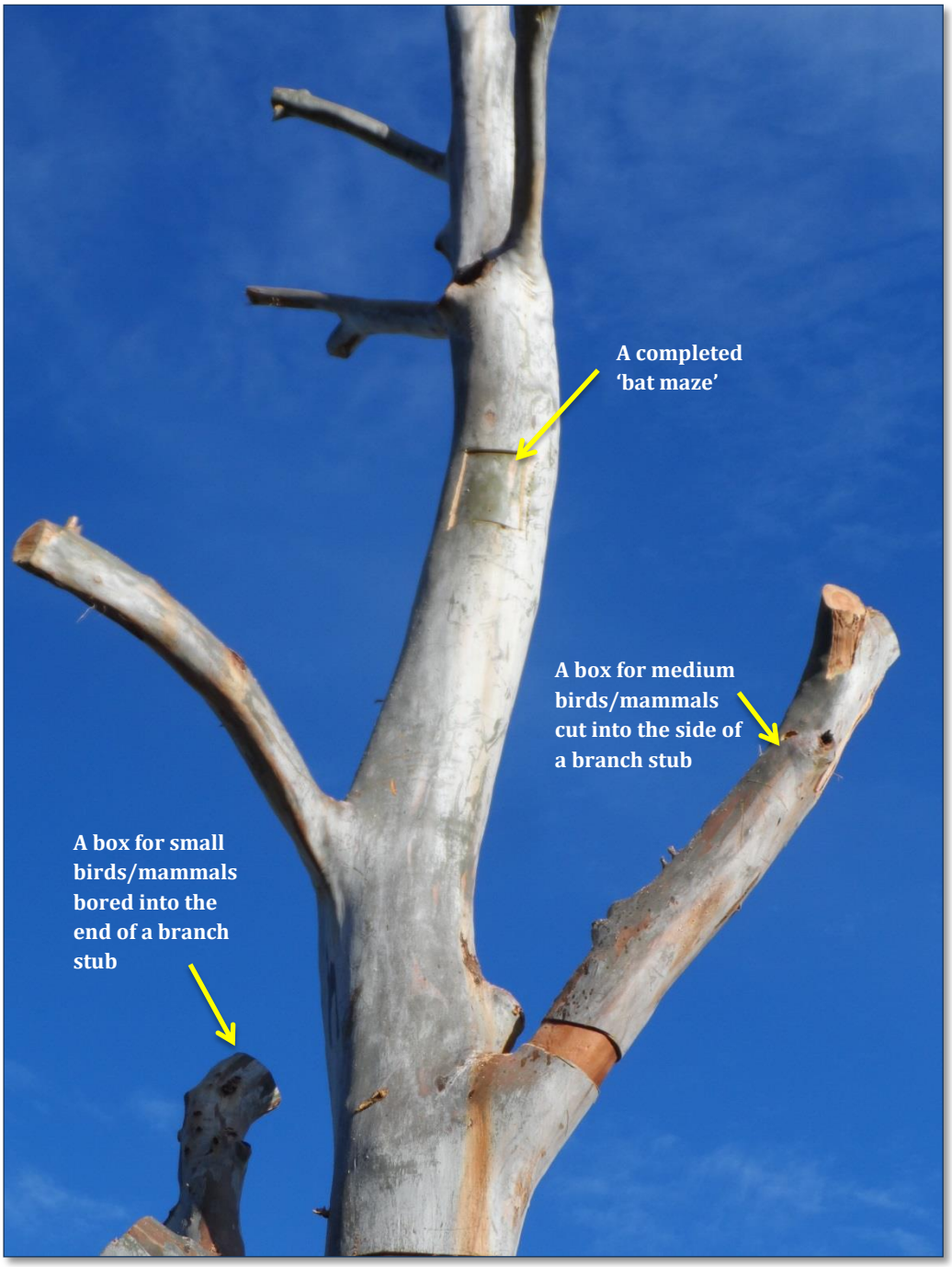


Figure 25 - Dead trees and the stems of trees up for removal provide excellent opportunities for habitat creation.

Creating terrestrial habitat with logs

Dead and decaying logs are used as a food source and habitat by many organisms, but are more often than not removed from urban settings. As already mentioned, the aesthetics of a dead log would not appeal to many, but the benefits to biodiversity and animal populations are considerable. In the author's opinion, however, logs are useful items for landscaping in that they offer a natural alternative to the usual products. This is particularly useful when creating bushland parks, with logs only adding to their authenticity.

The largest problem with using logs for habitat purposes is their suitable positioning within the landscape, which often requires the assistance of heavy lifting machinery such as cranes, and their associated access restrictions.

If access and machinery are available, little other work is required save for some fairly simple sculpting. In cases where decay is already extensive enough, no further sculpting is necessary.

Figure 26 - An example of a log that is decayed enough that no further cutting is required.

Figure 27 – The same log after it was placed into a bushland park adding to the site's authenticity and, hopefully, its biodiversity.

The sculpting of logs for the benefit of terrestrial animals – particularly reptiles and invertebrates – is fairly straight forward. Boring into the ends of logs is used to create hollows, but also to promote decay. “Trench cuts” along the underside of logs are made for the shelter of animals in spaces that predators cannot reach, and also allow for the introduction of decay.

Figure 28 - "Trench cuts" have been made to what will be the underside of this log.

Figure 29 - Boring into the end of logs creates shelter and promotes decay.

Deliberately making cuts that overlap and form rough edges creates small nooks for invertebrates, and results in a larger surface area for decay to enter via.

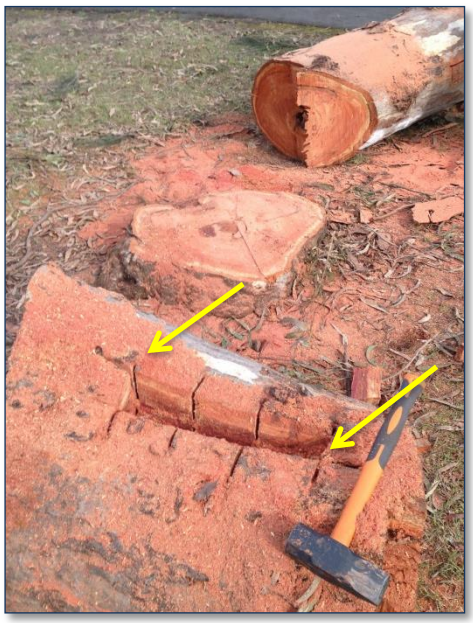


Figure 30 - Try to make sculpting as rugged as possible by overlapping the cuts.

Figure 31 - The finished product, waiting to be rolled over and positioned.

In the right circumstances, a full tree can be used as a landscaping feature[6] – just fell it, isolate it, landscape the surrounds and watch the critters come.

Figure 32 – Before.

Figure 33 – After.

[6] Victoria Tree Industry Organisation (VTIO). 2010. *Habitat Creation.*

Creating aquatic habitat with logs

Logs and snags are essential shelter for any underwater inhabitants, as well as perches for amphibians and birds that also use the area. However, there are more obstacles to overcome than with the use of logs on land. Firstly, more cutting is generally involved, and logs may need to be anchored or otherwise fixed so they do not move with currents or water levels. The greatest challenge however lies in the positioning of the logs, without actually getting in the water yourself.

Figure 34 - Heavy lifting machinery is usually necessary for the creation of aquatic habitat.

Figure 35 - Extensive sculpting can be applied to logs, for both above- and below-water sections.

Positioning logs atop one another creates ideal underwater protection, however this can be trickier than you would imagine. Constructing the desired structure on land and lifting it into the water in one piece is a way around this.

Figure 36 - The crude construction of a ‘fish crate’.

Figure 37 - A 'fish crate' in position.

Below is an example of a large log that is intended for use as below- and above-water habitat in a lake. Sculpting includes turtle rests, bore cuts, slits for crustaceans, extended existing decay and a duck hollow (not visible).

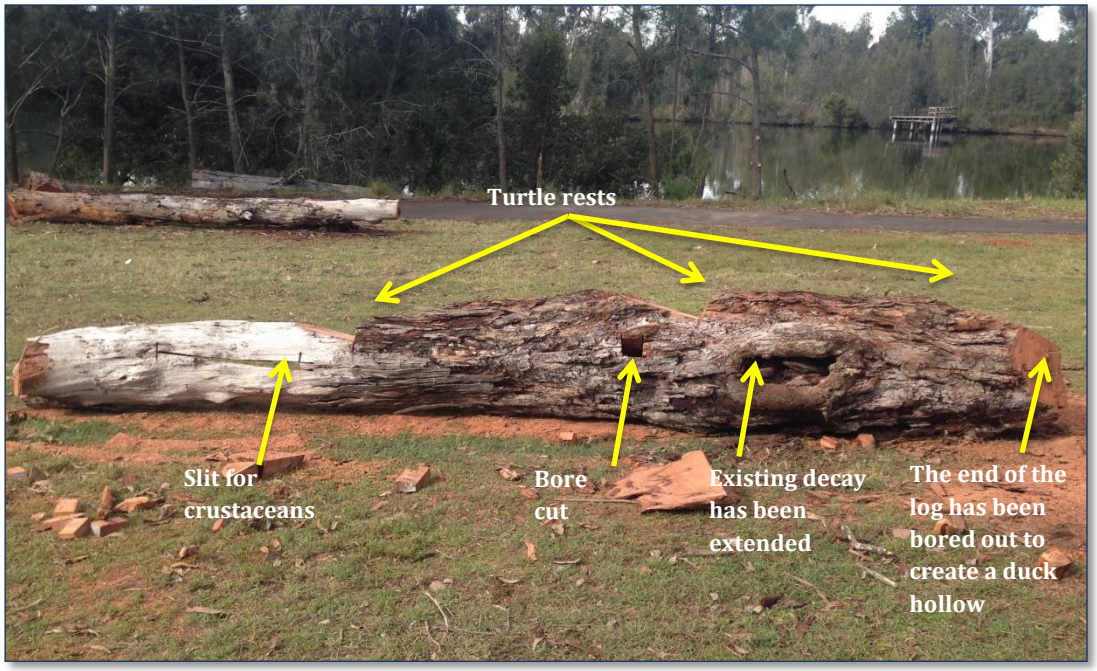


Figure 38 - A log sculpted for above- and below-water habitat.

Creating structures on land before lifting into position saves a lot of time. Timber that would normally be turned into wood chip has been used to construct 'fish crates'. These are assembled easily and require minimal sculpting other than boring into the ends of logs and creating 'shrimp slots'.

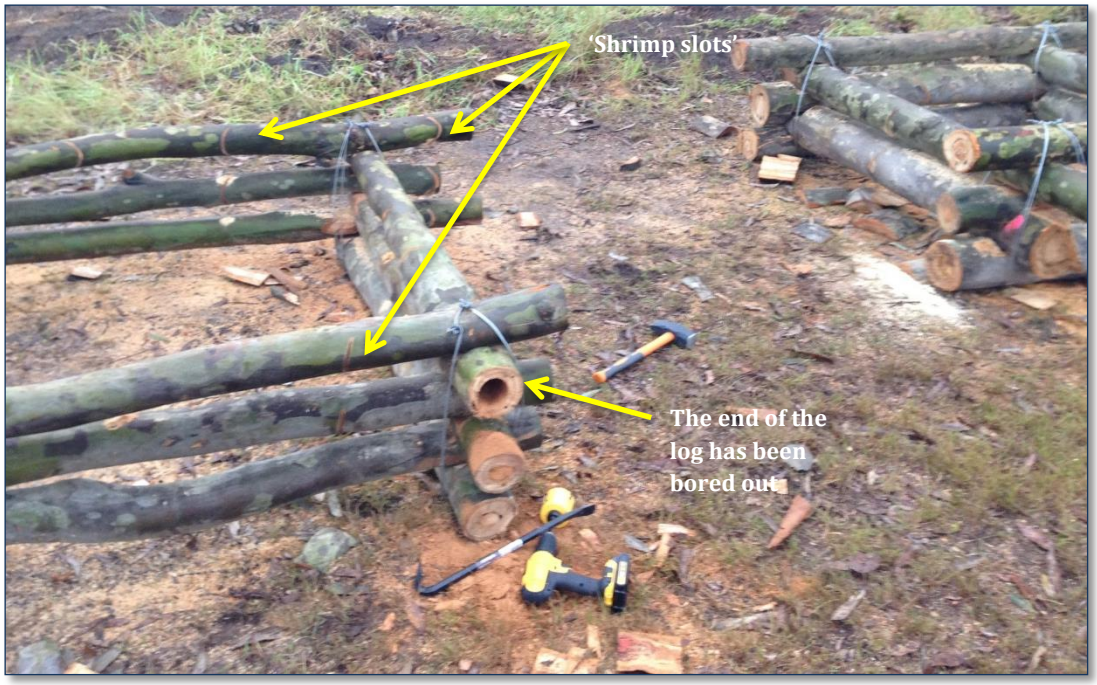


Figure 39 - 'Fish crates'.

Slightly more involved is the process of utilising dead trees and logs as standing aquatic habitat. It is only a possibility when wetlands or water bodies are being initially created or drained for rejuvenation. It involves the 'planting' of dead trees or logs in an upright position, using heavy lifting and excavation machinery, to create an effect similar to what is pictured below.

Nesting boxes and platforms are then installed as desired.

Figure 40 - An example of standing aquatic habitat.

Figure 41 - Aquatic habitat doesn't all have to be upright. Horizontal branches make valuable perches.

Species requirements

Certain animals have requirements when selecting habitat, driven by evolutionary necessities such as accessing food sources, raising young and avoiding predation. These requirements include the height above ground, the aspect and orientation, the entrance hole size and internal dimensions. This is handy for us, as it means we can create habitat with an exact species in mind.

Below is a list of some 80 obligate hollow-using species that occur across the Sydney region, any of which would – in our opinion – make great tenants on your property.

- Australian King Parrot (*Alisterus scapularis*)
- Australian Owlet Nightjar (*Aegotheles cristatus*)
- Australian Wood Duck (*Chenonetta jubata*)
- Barking Gecko (*Underwoodisaurus milii*)
- Barking Owl (*Ninox connivens*)
- Barn Owl (*Tyto alba*)
- Blue Mountains Tree Frog (*Litoria citropa*)
- Blue-tongued Skink (*Tiliqua scincoides*)
- Brown Treecreeper (*Climacteris picumnus*)
- Brushtail Phascogale (*Phascogale tapoatafa*)
- Buff-rumped Thornbill (*Acanthiza reguloides*)
- Chocolate Wattled Bat (*Chalinolobus morio*)
- Common Brushtail Possum (*Trichosurus vulpecula*)
- Common Ringtail Possum (*Pseudocheirus peregrinus*)
- Chestnut Teal (*Anas castanea*)
- Crimson Rosella (*Platycercus elegans*)
- Dollarbird (*Eurystomus orientalis*)
- Dusky Woodswallow (*Artamus cyanopterus*)
- Eastern Broad-nosed Bat (*Scotorepens orion*)
- Eastern Dwarf Tree Frog (*Litoria fallax*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Freetail Bat (*Mormopterus norfolkensis*)
- Eastern Pygmy Possum (*Cercartetus nanus*)
- Eastern Rosella (*Platycercus eximius*)
- Feathertail Glider (*Acrobates pygmaeus*)
- Galah (*Eolophus roseicapilla*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Glossy Black Cockatoo (*Calyptorhynchus lathami*)
- Gould's Long-eared Bat (*Nyctophilus gouldi*)
- Gould's Wattled Bat (*Chalinolobus gouldii*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Greater Glider (*Petauroides volans*)
- Green Tree Frog (*Litoria caerulea*)
- Grey Strike Thrush (*Colluricincla harmonica*)
- Grey Teal (*Anas gracilis*)
- Lace Monitor (*Varanus varius*)
- Large Forest Bat (*Vespadelus darlingtoni*)
- Laughing Kookaburra (*Dacelo novaeguineae*)
- Little Corella (*Cacatua sanguinea*)
- Little Forest Bat (*Vespadelus vulturnus*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Littlejohn's Tree Frog (*Litoria littlejohni*)
- Long-billed Corella (*Cacatua tenuirostris*)
- Pacific Black Duck (*Anas superciliosa*)
- Peregrine Falcon (*Falco peregrinus*)
- Peron's Tree Frog (*Litoria peronii*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Masked Woodswallow (*Artamus personatus*)
- Musk Lorikeet (*Glossopsitta concinna*)
- Nankeen Kestrel (*Falco cenchroides*)
- Rainbow Lorikeet (*Trichoglossus haematodus*)
- Red-rumped Parrot (*Psephotus haematonotus*)
- Red-browed Treecreeper (*Climacteris erythrops*)
- Sacred Kingfisher (*Todiramphus sanctus*)
- Scaly-breasted Lorikeet (*Trichoglossus chlorolepidotus*)
- Scarlet Robin (*Petroica boodang*)
- Short-beaked Echidna (*Tachyglossus aculeatus*)
- Sooty Owl (*Tyto tenebricosa*)
- Southern Boobook Owl (*Ninox boobook*)
- Southern Leaf-tailed Gecko (*Phyllurus platurus*)
- Southern Myotis (*Myotis macropus*)
- Spotted Pardalote (*Pardalotus punctatus*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Striated Pardalote (*Pardalotus striatus*)
- Sugar Glider (*Petaurus breviceps*)
- Sulphur Crested White Cockatoo (*Cacatua galerita*)
- Swift Parrot (*Lathamus discolor*)
- Tiger Quoll (*Dasyurus maculatus*)
- Tree Martin (*Petrochelidon nigricans*)
- Turquoise Parrot (*Neophema pulchella*)
- Velvet Gecko (*Oedura lesueurii*)
- White-breasted Woodswallow (*Artamus leucorynchus*)
- White-browed Woodswallow (*Artamus superciliosus*)
- White Striped Freetail Bat (*Austronomus australis*)
- White-throated Treecreeper (*Cormobates leucophaea*)
- Wood Gecko (*Diplodactylus vittatus*)
- Yellow Bellied Glider (*Petaurus australis*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)
- Yellow Tailed Black Cockatoo (*Calyptorhynchus funereus*)

Recommended orientations

Microbats need to increase their body temperature before their nightly foraging, so they prefer a north-westerly aspect which catches the late afternoon heat. 'Bat flats' should be orientated from NW to NNE, as shown by the **blue** segment in Figure 42.

Birds and mammals prefer an aspect from NE to S (as shown by the **green** segment in Figure 42), but ideally due east. This orientation avoids the hottest afternoon sun, and also prevailing south-westerly rains.

Aspects shown in **red** below should be avoided.

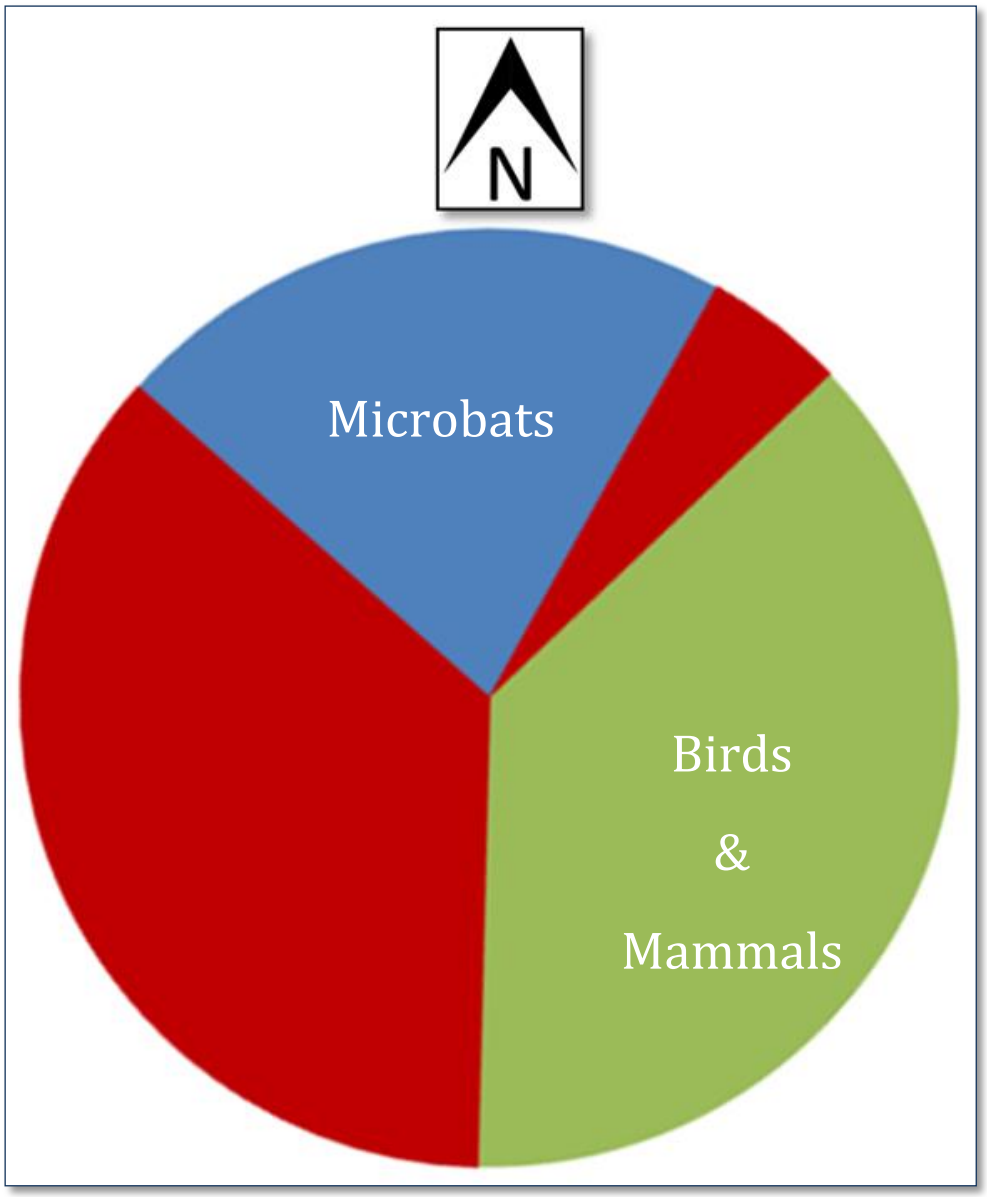


Figure 42 - Recommended orientations[7].

[7] fauNature. 2014. *Hollow Dependent Wildlife.*

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2-6, 8-19, 22-24, 26-30, 33-38 – Michael Sullings, Sydney Arbor Trees

21, 22, 32, 33 – Pat Kenyon, Tree Tactics, Kilmore, Victoria

40 - **http://lok-chiak.blogspot.com.au/2012/05/freshwater-fishing-in-khao-sok-national.html**

41 - **http://www.cwrl.utexas.edu/~bump/images/Bastrop/Bastrop%20Pines%20and%20Parks/**